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Patent

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of

Volker HARLE et al.

Serial No.: n/a

Filed: concurrently

For: METHOD FOR FABRICATING A  
PLURALITY OF SEMICONDUCTOR  
BODIES, AND ELECTRONIC  
SEMICONDUCTOR BODY

**LETTER TRANSMITTING PRIORITY DOCUMENT**

Mail Stop **Patent Application**  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

SIR:

In order to complete the claim to priority in the above-identified application under 35 U.S.C. §119, enclosed herewith is the certified documentation upon which the priority claim is based as follows:

Application No. **EP 03003442.5**, filed on February 14, 2003, in Europe,  
Application No. **DE 10319555.6**, filed on April 30, 2003, in Germany,  
Application No. **DE 10320160.2**, filed on May 06, 2003, in Germany.

Respectfully submitted,  
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5367-69

**Bescheinigung**

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**Attestation**

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europäischen Patentanmel-  
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The attached documents  
are exact copies of the  
European patent application  
described on the following  
page, as originally filed.

Les documents fixés à  
cette attestation sont  
conformes à la version  
initialement déposée de  
la demande de brevet  
européen spécifiée à la  
page suivante.

**Patentanmeldung Nr. Patent application No. Demande de brevet n°**

03003442.5

Der Präsident des Europäischen Patentamts;  
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets  
p.o.

**R C van Dijk**



Anmeldung Nr:  
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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:  
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.  
If no title is shown please refer to the description.  
Si aucun titre n'est indiqué se referer à la description.)

Reduction of dislocation density using in situ deposited SiN intermediate layers  
in AlGaIn/GaN hetero-structures grown by MOVPE on SiC substrates

In Anspruch genommene Priorität(en) / Priority(ies) claimed /Priorité(s)  
revendiquée(s)  
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AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LU MC NL  
PT SE SI SK TR LI

14. Feb. 2003

**Reduction of dislocation density using in situ deposited SiN intermediate layers in AlGaIn/GaN heterostructures grown by MOVPE on SiC substrates.**

For high performance GaN based optoelectronic devices such as blue laser diodes GaN layers with high crystalline quality and low defect density are required. With standard metalorganic vapor phase epitaxy techniques typical defect densities in the range of  $10^9 \text{ cm}^{-2}$  can be achieved on SiC substrates.

The defect density can be reduced with an in situ method [1] by depositing an intermediate SiN layer. By treating AlGaIn respectively GaN layer with  $\text{NH}_3$  and  $\text{SiH}_4$  the surface is fractionally covered with SiN. Lateral overgrowth of this structure leads to the reduction of defects.

SiN intermediate layers have been grown on n-doped AlGaIn and GaN films by MOVPE on SiC substrates. SiN growth temperature as well as growth pressure of the overgrown (Al)GaIn layer have been varied to study the influence on defect density and morphology. The density of edge dislocations has been reduced by a factor  $>10$ .

The samples were characterized by optical and secondary electron microscopy and XRD measurements. Dislocation density was determined by hot wet chemical etching with phosphoric acid [2] and atomic force microscope measurements. Propagation of dislocations were analyzed by transmission electron microscopy.

[1] Tanaka et. al., JJAP 39, L 931 (2000)

[2] Visconti et. al., APL 77, 3532 (2000)

EPO - Munich  
41

14. Feb. 2003

**Claims:**

1. GaN based semiconductor device comprising a AlGaIn/GaN heterostructure, having an SiN intermediate layer being in situ deposited in said AlGaIn/GaN heterostructure.
2. Method for fabricating a GaN based semiconductor device comprising a AlGaIn/GaN heterostructure, wherein the defect density is reduced by in situ deposition of an SiN intermediate layer in a AlGaIn/GaN heterostructure.